ENTOMOLOGY.—Specularius erythrinae, *a new bruchid affecting seeds of* Erythrina (*Coleoptera*).[1] JOHN C. BRIDWELL, U. S. National Museum. (Communicated by C. F. W. MUESEBECK).

When some future philosopher assembles data for the psychology of the color red he may well consider the brilliant red flowers and beans of *Erythrina* which have attracted the attention of men of all races. Few plants encountered by visitors in the tropics are so admired and the literature of botanical exploration is full of tributes to these glorified bean plants grown large, often of tree size, the leafless branches adorned with masses of red or near-red flowers. Aztecs, Negroes, Hindoos, Hawaiians, and Australian blacks have had a lively interest in the species in their own countries and, finding many uses for these plants and their products, have distributed some of them in cultivation far from their original homes. The botanists distinguish some thirty species of *Erythrina*. Three of these occur in the warmer parts of the United States. One, *Erythrina herbacea* Linnaeus, is a perennial herb found from North Carolina to Texas, bearing long racemes of scarlet flowers, each itself two inches long, succeeded by pods containing brilliant scarlet beans, in form not unlike kidney beans. Torrey and Gray report, on the authority of Dr. Boykin, that its irregular branched rootstock is esculent and it is reported that the roots of some tropical American species are eaten. The flowers and tender leaves of some species are used as salad or as cooked vegetables. The flower buds of one species are boiled and eaten with meat. Wilson Poponoe[2] found that the large seeds of *Erythrina edulis* Triana form an important article of food for the Indians of certain mountainous regions of Colombia and praised the flavor of the dish prepared in their manner. Most species, however, are reputed to contain dangerously poisonous substances in seeds and bark. The seeds of some are used to poison rodent pests and the bark serves as a fish poison. Poisonous substances have been isolated from some species and named but this work needs to be repeated with modern methods and their reputed medicinal properties require investigation for acceptance. The flowers and bark are said to yield dyes and the bark a useful fiber. The light, soft, easily-worked wood serves many uses, for temporary posts and firewood, and in making corks, toys, images of saints, light boxes, lacquer ware, scabbards, shields, wooden dishes, water troughs and canoes. The Australian blacks dragged the light

[1] Received January 5, 1937.
[2] WILSON POPONOE, 1923, in Bur. Plant. Ind. Inventory of Seeds and Plants Imported **64**: 89–90, no. 51357.

unworked logs into the water to use in crossing creeks and rivers. The branches are usually armed with stout sharp prickles and readily strike root when thrust into the ground. Hence they are often used for hedges to protect garden plots. Being legumes with root nodules supporting nitrogen-fixing bacteria they have soil-improving properties, discovered long before the reason became apparent. Hence, in spite of the brittle nature of the branches, which lessens their value, they have come to be used to a considerable extent for shade for coffee, tea, cacao, and the *Areca* palm and as support for the vines of the true pepper. Although generally considered poisonous the seeds are widely used for necklaces and other ornamental purposes and in children's games and in games of chance by their elders. But, perhaps more generally than for any other reason, they are grown as ornamental trees because most of the human race is fond of the color red.

While working on the biology of Bruchidae in Hawaii I encountered two species of *Erythrina*. One is a native species not found elsewhere, the wili-wili tree, *Erythrina monosperma* Gaudichaud. This tree is often frequented by *Caryedon fuscus* (Goeze), formerly called *Caryoborus gonagra* (Fabricius), many adult beetles hiding by day in the partially opened pods. I have seen hundreds of eggs laid upon the seeds but not one larva was able to develop within them. The Indian coral-tree, *Erythrina variegata* Stickman, formerly known as *E. indica* Lamarck, is a common ornamental tree and its seeds were obtained in quantity for experiment. Most of the species of Bruchidae available deposited their eggs upon the seeds in confinement but none could develop within them, as was anticipated in both cases because of the reputed poisonous nature of the seeds.

In September 1920, W. S. Fisher, our well known specialist in Buprestidae and Cerambycidae, was serving temporarily as inspector for the Federal Horticultural Board and intercepted the first examples of a bruchid affecting the seeds of an *Erythrina*. This was an undetermined species collected by Dr. H. L. Shantz, of the Bureau of Plant Industry with the Smithsonian Expedition at Chuka, Kenia Province, under the equator far in the interior of British East Africa. This insect could not then (or now) be referred to any described genus or species and is described here as *Specularius erythrinae*, in allusion to the mirror-like area on the pygidium and to the host-plant in the seeds of which it develops.

While in India I was surprised to find the same species in December 1924 affecting the seeds of *Erythrina variegata* in the suburbs of Bombay on the island of Salsette and learned something of its habits. It was also found in Savantvadi State, some fifteen miles inland from the port of Vengurla in British India along the heavily traveled highway leading up to Belgaum in the interior; and at Mormugao Harbor in Goa, Portuguese India, a few miles away; and again down the coast at Mangalore, a port of British India. Upon returning to America in 1927 I found in the National Museum one lot of the species intercepted in the seeds of *E. abyssinica* Lamarck (*E. tomentosa* R. Brown) from Amani, Tanga, Tanganyika Territory, and another taken from the seeds of an undetermined *Erythrina* at Sabang, Pulu We Island, on the north coast of Sumatra, by David Fairchild and P. H. Dorsett of the Bureau of Plant Industry, while accompanying the Allison V. Armour expedition into that region. Subsequently the species has been intercepted by inspectors of the Bureau of Entomology and Plant Quarantine, mostly in the seeds of *Erythrina abyssinica* from various east and south African localities. I know of no records of the seeds of *Erythrina* being attacked by other Bruchidae or by this species in Australasia or America, nor has this species been known to attack other legumes.[2a]

Specularius, n. gen.

The most conspicuous character of *Specularius* is the dark brown, glabrous, highly polished, mirror-like, circular area, occupying the greater part of the plane, sub-vertical pygidium in both sexes, elsewhere found only in the Brazilian *Gibbobruchus speculifer* (Gyllenhal), another member of the Bruchidae, Bruchinae, believed to be not closely allied to *Specularius*.

Type of the genus, *Specularius erythrinae*, n. sp.

Specularius erythrinae, n. sp.

Brownish-red with suffused darker, or piceous-black, areas on the head antennae, pronotum, elytra, breast, hind coxae, femora beneath, some of the sternites, and pygidium; densely pubescent with coarse appressed hairs (often abraded) concealing the sculpture except for naked or partly naked areas on elytra, hind coxae, and pygidium; this pubescence is tawny, varying to whitish in maculate areas, and darker (blackish) on the darker elevated areas of pronotum and elytra; with large coarse punctures and coarse micro-sculpture, very irregularly disposed.

Head short with short malar space; eyes moderately granulate, strongly convex and strongly projecting, emarginate for about two thirds of their length; front strongly carinate, separating the eyes at the clypeus by a little more than the width of their upper lobe; temples abruptly declivous to the contraction; antennae about half as long as the body, a little stouter and more expanded in the male, pubescent, compressed, expanded and serrate,

[2a] Note added in proof: Since this paper was written a brief note has appeared in Proc. Hawaiian Ent. Soc. 9: 368, 1937, saying: "Mr. D. T. Fullaway mentioned having reared . . . *Bruchus pruininus* from *Erythrina* seeds from the Waianae Mts." It may be that these beetles were hidden in the pods. My experience with *B. pruininus* would lead me to doubt its being able to develop in *Erythrina* seeds.

beginning with the 5th joint; 1st and 4th joints subequal in length and breadth; 2nd and 3rd joints shorter, similar to each other, about as long as broad; 5th broader than 4th, its apical angle a little produced; 6th–10th similar to each other, narrowed to base, the inner angle strongly produced, these joints about as long as broad; 11th narrowly ovate, subacute at apex.

Pronotum conical, its sides nearly straight, converging anteriorly to a little more than one third of basal width, with very uneven surface, with a median longitudinal elevation obsolescent in the middle and not strong anteriorly, divided by a median longitudinal sulcus strong on the basal lobe, obsolete in the middle, visible anteriorly, together forming four elevations of which the basal pair are much stronger, outside these in the middle separated from the basal pair by a depression is another similar elevation on either side; lateral lobes strongly depressed; flanks narrow, vertical, not separated from the dorsum; lateral margin represented by a feeble vestigial carina above the coxa, seen with difficulty when denuded of pubescence; cephalic foramen of prothorax strongly inclined backward below; prosternum a little less inclined, triangular, separating the coxae for two thirds their length; mesosternum truncate at apex, descending below prosternum about as far as its length, overlapping the metasternum obliquely; mesepimeron subtriangular, somewhat acuminate along the meso-metapleural suture, ending remote from the coxal cavity; scutellum small, longer than broad, emarginate and bidentate at apex; elytra broader than pronotum basally, broader in the middle, together somewhat longer than broad, separately broadly rounded at apex and serrulate near the suture, depressed along the suture, striae 2, 4, 6, and 8 slightly interruptedly elevated, the elevations accentuated by the pubescence which is blackish on the elevations, an area on the 2nd, 3rd, and 4th intervals[3] within and behind the humeral calli is most strongly elevated (3rd interval depressed between the strong elevations of 2nd and 4th intervals); striae strongly impressed with strongly impressed punctures; intervals without punctures, more or less transversely rugulose and flat except for the elevations of the alternate intervals (which with the humeral calli are evenly transversely finely ridged); sutural margin in the middle some distance behind the scutellum dark with dark pubescence; denuded elytron irregularly checkered with reddish and blackish, all intervals, margins and the apex bearing some dark markings; 10th stria abbreviate at about the apical third; 4th and 5th striae abbreviate at apex; 2nd, 5th, 6th and 10th striae extending nearer the base than the others; base without tubercles or denticles.

Front and middle legs without special structures of note; hind coxa about as broad as the two sternites next behind it, slightly broader than the femur, with rather coarse piliferous punctures denser in the middle, lateral fourth more densely pubescent, hind margin naked, a narrow densely punctate and pubescent band just before the hind margin extending far toward the insertion of trochanter; hind femur compressed nearly straight beneath for most of its length, gradually arcuately widened above to beyond the middle, then more suddenly narrowed to apex; ventral edge flattened, inner and outer margins of ventral surface subcarinate apically, inner ventral margin emarginate and armed before the emargination with a strong acute suberect tooth and beyond it with one or two small denticles, and before it with one or two feeble serrulations, outer ventral margin with a small rounded con-

[3] The intervals are numbered here from the striae outside which they lie beginning with the stria nearest the suture as stria 1, hence there are nine intervals and sutural and lateral margins on each elytron.

dylar lamina, emarginate before the lamina and subangulate before the emargination; flexed tibia resting between this subangulate process and the great tooth of the inner margin; tibia nearly straight, dorsoventrally widened at apex to about three times its basal width, bearing at apex a strong porrect acute mucro, nearly as long as breadth of tibia, a shorter triangular lateral tooth, and three small subequal subdorsal teeth; outer face with a ventral longitudinal carina, a less elevated intermediate carina obsolescent at apex where it approaches the base of the mucro and a strong lateral longitudinal carina ending in the lateral tooth; basitarsus more than half as long as tibia, gently arched in the middle, produced into a tooth at apex beneath, with a longitudinal carina on outer and inner faces and a single ventral longitudinal carina; second tarsal joint longer than broad, not expanded apically, feebly longitudinally carinate and produced at apex beneath; lobes of third joint feeble, not expanded; ungues appendiculate.

Abdomen shorter than the breast, not attaining the apex of elytra or of hind femora, three intermediate sternites subequal, each shorter than the first sternite behind the coxa and longer than the fifth in the male, shorter in female; pygidium flat nearly vertical, broadly triangular, bearing on the disc a large polished, reflecting area surrounded by a border of whitish pubescence concealing the surface; this area is dark brown with some irregularly disposed, strongly impressed punctures arranged in a marginal series with others scattered within; male pygidium slightly reflexed at apex and subtruncate, with another tergite visible between pygidium and narrowed fifth sternite.

Length from anterior margin of pronotum to apex of elytron 2.6–4 mm; width 1.75–2.8 mm.

Described from a type series in the United States National Museum of 52 ♀s and 33 ♂s, with accompanying material showing eggs, pupae, work in host seeds, and dissections. Type no. 52331 U.S.N.M.

Type locality: Amani, Tanga, Tanganyika Territory, East Africa, type male, allotype female and two female paratypes labelled "Amani, Tanga, East Africa on *Erythrina tomentosa* F.H.B. 89143 March 31, '25."

Additional localities and material as follows:

AFRICA: Chuka, Kenia Province, Kenia, 3 ♀s, 1 ♂, and 3 seeds of host plant labelled as from Nairobi intercepted by W. S. Fisher F.H.B. 37623 (Cf. Inventory **65**: 33, 34 no. 51637. From seeds of *Erythrina* sp. collected by H. L. Shantz, June 16, 1920). Amani, (2nd lot), 3 ♀s, 2 ♂s, 3 seeds of host plant labelled "Seed of *Erythrina tomentosa*, 12.X. '28, H. Y. Gouldman, P. Q. & C. A. 7581." South Africa, 5 ♀s, 3 ♂s, 3 seeds of host plant labelled "Ex *Erythrina* from So. Africa, San Francisco, Cal. Jul. 1, '29 G. Wilson." Natal, 2 ♀s, 1 ♂ labelled "Natal, South Africa Sept. '36 coll. R. H. Smith host *Erythrina abys[s]yni[c]a*." Rhodesia, 3 ♀s, 2 seeds of host plant [*Erythrina sp.*] labelled "Wilmore Kentucky Nov. 12, 1937 ex beans from Rhodesia, S. Africa." (One additional female paratype and one seed of host plat were returned to the sender, Lee H. Townsend, University of Kentucky.)

INDIA: Goregaum, Bombay Salsette, 12 ♀s, 9 ♂s, 10 fragmentary adults and dissections from them, 5 cocoons containing adults, 2 empty cocoons, 4 pupae, 9 seeds of host plant (*Erythrina variegata*, labelled *E. indica*, Dec. 1924). Borivli, Bombay Salsette, 12 ♀s, 8 ♂s Jan. 1925. Savantvadi State, 5 ♀s, 5 ♂s, bred from *Erythrina variegata*, labelled *E. indica* April, 1926. Mormugao Harbor, Goa, Portuguese India, 1 ♂ coll. Sept. '25. Mangalore, 1 ♀ coll. Jan. '27. All these bred or collected by J. C. Bridwell.

SUMATRA; Sabang, Pulu We Island, 2 ♀s, 1 ♂ labelled "Sumatra D. Fairchild D.F. 431 (Cf. Inventory **87**: 22. Obtained by David Fairchild and P. H. Dorsett. S.P.I. no. 67182. *Erythrina* sp. No. 431. February 17,1926)."

Dark pubescent spots on the pygidium are not unusual in Bruchidae and glabrous polished areas occur in groups of the Bruchinae otherwise unlike. Such an area occurs upon the pygidium of the female of *Bruchidius stierlini* (Allard), (affecting *Scorpiurus compressus* Linnaeus in the Mediterranean Region), which has been absurdly considered a variety of *Bruchidius seminarius* (Linnaeus). But in this species the area is convex and the pygidium oblique and the insect is otherwise quite unlike *Specularius*. In some American Bruchinae affecting seeds of *Bauhinia* and *Cercis* perhaps referable to *Gibbobruchus* Pic, polished glabrous areas are found on the female pygidium. Our *Gibbobruchus mimus* (Say) breeding in the seeds of *Cercis canadensis* Linnaeus has a cordate glabrous polished area on the female pygidium but this is convex and oblique and femoral characters forbid association with *Specularius*. These femoral characters are found also in *Gibbobruchus speculifer* (Gyllenhal) in which the pygidium is much more like that of *Specularius* and the mirror-like area is present in both sexes. The similarity of structure of hind legs, scutellum and antennae leads me to place these American forms in *Gibbobruchus*. The strongly elevated pronotum which Pic used as the principal character for his group does not run through the genus and in two undescribed species which certainly belong with *mimus*, and probably with *speculifer*, the median longitudinal elevation is so reduced as to be almost imperceptible. In all the species which I should place in *Gibbobruchus* the scutellum is transverse (emarginate and bidentate at apex) and thus unlike the oblong scutellum of *Specularius*. The hind femur expands above and below in similar even opposed curves to the middle and similarly narrows to apex. The flexed tibia is received in a groove on the ventral edge of the femur. The outer margin of this groove is armed with a long series of denticulations or serrulations and the inner margin bears near apex a stout tooth and a series of three or more strong acute denticles beyond it, quite unlike the one or two feeble denticles in the same position in *Specularius*. The tibia is more slender and arcuate and lacks the lateral tooth at appex; the intermediate longitudinal carina is more strongly developed so that the tibia is distinctly sulcate beneath with the inner or ventral carina somewhat more elevated than the outer or intermediate. The basitarsus is not produced into a tooth at apex beneath. In none of them can the antennae be said to resemble those of *Specularius*.

I have thus particularly compared *Specularius* with *Gibbobruchus* since the differences found seem to remove any probability of an American origin for this genus of uncertain nativity. I believe the genus originated in the interior of Africa and was taken to India and Sumatra by inhabitants of India who were employed in Africa and carried back with them the brilliant scarlet seeds of *Erythrina abyssinica* or other species containing the larvae of *Specularius*.

If *Specularius* is of African origin and not closely allied to *Gibbobruchus*, its kin must be sought among Old World Bruchidae without the peculiar pygidial mirror. Pic has established a genus *Callosobruchus* of which *Curculio chinensis* Linnaeus 1758 (= *Bruchus scutellaris* Fabricius 1792 = *Bruchus pecti[ni]cornis* Linnaeus 1767) is the genotype. The callus of the basal lobe of the pronotum was considered by Pic as its distinguishing character but this is found in other genera and is not found in some species which must be placed near *chinensis* because of other characters. As understood by me the genus is represented by many species in the Old World tropics, Africa, southern Asia, and Malaysia. Three of these have been widely distributed in commerce and established in many countries where their favored host plants are grown. These are *C. chinensis*, *C. maculatus* (Fabricius 1775) (= *quadrimaculatus* Fabricius 1792) and *C. phaseoli* (Gyllenhal 1833), all affecting food legumes of Old World origin. Also affecting Old World food legumes but not yet, apparently, established in the Americas are the important economic species *C. analis* (Fabricius 1781), *C. theobromae* (Linnaeus 1767), *C. subinnotatus* (Pic 1914) and other species of still undetermined status. One somewhat aberrant species, *C. ademptus* (Sharp 1886) extends out of the tropics into temperate northeastern Asia affecting the kudzu, *Pueraria thunbergiana* Bentham. Another extra-tropical species, *C. spiniger* (Baudi 1886) is found in Asia Minor and the Eastern Mediterranean Islands, its food plant still unknown. Besides these, numerous species attached to non-economic leguminous host plants are found in tropical Africa, Asia and Malaysia. All these agree in having the hind femur armed beneath near apex within and without with a strong tooth. In *ademptus* only is the outer tooth so reduced as to suggest comparison with the slight subangulate process in the same position in *Specularius*. None of them have any trace of denticles beyond the tooth on the inner margin. In all the basitarsus resembles that of *Specularius* but the ventral carina is double with a narrow sulcus separating the carinae. The mesepimeron is more acuminate along the pleural suture, reaching nearly or quite to the trochantin extension of the mesocoxal cavity and in none of them are the irregularities of the pronotum so fully developed. The elytra lack the irregularities of surface in *Specularius*, the tenth stria is less abbreviate and striae 2, 3, 4, 5, and 6 extend evenly to the base of the elytron. All the species have stronger sex dimorphism than found in *Specularius*, the sexes differing in coloration of elytra and pygidium, in antennal structure, and in form and inclination of pygidium and fifth sternite. Hence it seems to me that *Specularius* must be considered closely allied to *Callosobruchus* but sufficiently unlike to be excluded from the genus.

The pods of the species of *Erythrina* remain for a long time attached to the trees and are only very tardily dehiscent. Being very brittle they become broken by the whipping of the branches in the wind and the seeds become exposed and fall to the ground as the pods open partially or are broken. It is not until the seeds are exposed that oviposition by *Specularius* takes place and the eggs are laid scattered on the seeds. The eggs resemble those of *Callosobruchus maculatus* being long ellipsoidal and firmly cemented to the seed. The contraction of the cement substance in hardening flattens the egg to an ovate outline with one pole elevated into a peak near one end. The larva enters the seed directly from the egg and develops within the cotyledon, preparing, when full grown, a strong cocoon attached to a window of the seed coat ready to be cut by the adult and pushed loose as a perfect disc when the adult emerges. In the smaller seed of *E. abyssinica* from one to three adults can develop while in the larger seed of *E. variegata* more than a dozen exit holes have been found. The seeds may be reinfested until the entire contents is destroyed. The tardy attack of *Specularius* upon the seeds of *Erythrina* makes it a simple matter to secure uninfested seeds for propagation if the pods are gathered promptly when they become ripe before the seeds are exposed.

However poisonous the seeds of *Erythrina* may be shown to be on further investigation there is nothing surprising in finding a bruchid adapting itself to feeding in poisonous seeds. *Bruchidius villosus* (Fabricius) is not deterred from destroying the seeds of *Cytisus scoparius* by the toxic alkaloid contained in them; the toxalbumen in the seeds of *Abrus precatorius* does not render them unsuitable for food for the larvae of *Caryopemon cruciger* (Stephens) in Africa and *C. lhostei* Pic in Ceylon. The rotenone in seeds of *Cracca virginiana* has no ill effect upon the larva of *Acanthoscelides obsoletus* (Say) and Trelease and Trelease[4] have recently shown that concentrations of selenium in the seeds of *Astragalus* lethal to vertebrate animals may be endured by *Acanthoscelides fraterculus* (Horn).

[4] Sam F. and Helen M. Trelease, 1937, Science **85**: 590; and Amer. Jour. Bot. **24**: 448–451, f. 1–4.